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## An Indentured Generation? The Effect of Student Debt on Entrepreneurship in the United States

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An Indentured Generation?  
The Effect of Student Debt on Entrepreneurship in the  
United States

A Capstone Project Submitted in Partial Fulfillment of the  
Requirements of the Renée Crown University Honors Program at  
Syracuse University

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Science  
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## **Abstract**

This paper discusses the topical issue of rising student debt and the effect it has on employment decisions, particularly entrepreneurship. This paper aims to analyze this relationship using labor economic theories on investing and saving, labor decisions and risk aversion. Additionally, it discusses the role of entrepreneurship on economic growth and globalization using both historical and present-day data gathered from the National Longitudinal Survey of Youth (1997—2011), The Kauffman Research Center, and the US Department of Education.

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## **I. Introduction**

This goal of this paper is to observe the relationship between student debt on occupational choices, particularly the choice to become an entrepreneur by using data from the National Longitudinal Survey of Youth (1997). Over the past decade, the topic of student debt in order to finance higher education has quickly shifted from being a household nuisance to a matter of public policy. With student debt surpassing \$1 trillion, greater than the United States total debt, the Obama Administration has launched a debt relief plan to help recent college graduates who simply cannot afford to repay down their debt. This exponential increase in student debt is largely due to the exponential increase in both the college enrollment and college tuition. College Board's annual report on college pricing reported that the average annual tuition for a private 4-year institution in 2014 grew by 197% to \$31,231 from \$10,511 in 1980 and the average annual tuition for a 4-year public institution grew by 280% to \$9,139 from \$2,405 in 1980. Today, college tuition in the United States exceeds the average person's annual income, making it extremely difficult for the average family to pay for college.

However, although the cost of college has risen, the college-wage premium for college graduates versus, non-college graduate is significant. The first theory, pioneered by Theodore W. Schultz and further developed by Gary Becker in 1970s, argued that the college wage premium increases because, by acquiring a college degree, the worker becomes more productive (Becker, 1972). The second theory, developed by Michael Spence, argues that a college degree signals the qualities of a productive worker, like a strong work ethic, dependability and intelligence, implying that the college degree itself does not add anything to the worker's productivity. These two theories have driven the assessment of higher education as an investment from two different perspectives. Over the past two decades, the demand for a college education has been positively

related to the increase in expected lifetime earnings that a college degree allows, however in reality, the expected benefits for any individual are uncertain since a college degree does not guarantee higher earnings.

Although overall college enrollment has been rising, totaling 10.5 million enrolled college graduates in 1980 to 17.6 million in 2009. The increase in enrollment is concurrent with the increasing wage differential between college graduates and non-college graduates. However, the annual volume of federal loans increased from 2.3 million loans to 10.9 million in 2009, clearly increasing a lot faster than college enrollment (Avery and Turner, 2012). This paper uses the standard-life cycle model to assess how an individual decides whether or not to attend college and furthermore how an individual decides how much debt is worth taking to finance this investment. Assessing college an investment decision allows for a clear break down of how an individual perceives future benefits and risk. Due to the increasing costs of a college degree and the increasingly inability to pay back debt post-graduation, the true of value of the college degree has been heavily scrutinized. This paper aims to build the link between the role of a college major, skill, and student debt and a student's overall occupational choice in the future.

Just as interest in higher education financing has been a topic of interest, entrepreneurship has almost simultaneously been a major point of criticism for the United States. In their 2011 best seller, *That Used to be Us: How America Fell Back in the World it Invented and How it Can Come Back*, Michael Mandelbaum and Thomas L. Friedman argue that the root of the United States "stagnant" state as a world superpower and innovator is largely due to the fact that creative and effective entrepreneurship, as in creations that actually have the potential to make a difference, is no longer as heavily encouraged as it once was. Peter Thiel's *From Zero to One* also criticizes the current state of entrepreneurship which is heavily focused on gamification,

social media, and mobile applications, as shallow, serving no purpose in the process of true innovation. Entrepreneurship in the United States has been heavily romanticized over the past two decades due to the wildly successful technology firms like Google, Amazon, PayPal, Twitter, Facebook. However, even outside the technology sector, entrepreneurship is considered to be an important vehicle for economic development through employment effects as well as welfare effects. This paper goes through the fundamental behavior of entrepreneurship relative to economic development by breaking it down in three stages: (1) the first stage of an economy is marked by high levels of entrepreneurship since it is heavily based on agriculture and small manufacturing firms, (2) the second stage, is marked by a decrease in entrepreneurship due to the increased size of manufacturing firms, and finally (3) the third stage is marked by high rates of entrepreneurship as the economy shifts from a manufacturing economy to a service economy, allowing for better conditions that support and allow for entrepreneurial opportunities to be profitable.

This paper discusses the two main conditions that need to be in place in order for entrepreneurship opportunities include a country's ability to promote start-up companies and the skills and motivation of those who wish to go into business themselves. This paper also discusses the specialist versus generalist argument that is widely associated with entrepreneurship. Many labor economists argue that an entrepreneur needs to have multiple skills is necessary to be a successful entrepreneur because having more skills allows you to understand the full picture and therefore create better and more efficient innovation. In this scenario, the argument is that individuals who want to be entrepreneurs invest in a broad range of skills, making the generalists versus specialists. On the other end of the spectrum, there are those who believe that effective entrepreneurship can only be achieved through specialization.



Other important aspects that play a role in the decision to become an entrepreneur or not are the risk factors, primarily those involving finances. The discussion of risk is important in the decisions for entrepreneurship for two reasons: an entrepreneur cannot be successful without taking risk however, an entrepreneur must also consider risk constraints involving finances. Debt capacity is an important factor in entrepreneurship because although entrepreneurs may use debt to finance their ventures, there comes a point where the amount of debt borrowed does not increase the value of the firm. The debt capacity of the firm measures the amount of debt a firm or individual can borrow up to the point where the value of the firm does not increase. The most prominent constraints a potential entrepreneur has to deal with are those having to do with access to capital to finance their ventures. This paper uses Evans and Jovanovic's (1989) model to help illustrate entrepreneurship under liquidity constraints. The essence of the model is used to illustrate potential entrepreneur's resources and his propensity to become an entrepreneur are positively correlated where the maximum amount of money an entrepreneur could borrow is his personal wealth.

The data used in this study is data collected from the NLSY97 to estimate the relationship between student debt (individual's debt shock) and entrepreneurship, described as self-employment. The data surveyed 8,984 American youth respondents starting in 1997. All of the respondents were born in 1980 through 1984, meaning they were ages 12 through 17 at the beginning of the survey. Up until 2011, the youth were interviewed 15 times. The purpose of this survey is to track the transition of from high school to college to the work place. The NLSY97 collected relevant data about respondents' education and employment history patterns. Demographic information, marriage information, employment history, education history, income history, and student debt history were all collected in a panel module on an annual basis. Because

there were four different cohorts (1980—1984) in the panel data, the relationship between student debt and entrepreneurship was analyzed from the base line at age 25.

The model used to describe a potential entrepreneur's decision to become an entrepreneur is based on wages from wage-working jobs versus the additional yield gained through self-employment (Evans and Jovanovic, 1989). Using Evans and Jovanovic's (1989) model again, entrepreneurial earnings quantified as:

$y = \theta k^\alpha \varepsilon$ , where  $k$  represents the amount invested in the business, and  $\varepsilon$  is the disturbance.

Therefore, an entrepreneur's net income is:

$y + r(z - k)$ , where  $r$  represents one plus the rate of interest,  $z$  is the amount of personal wealth, and recall  $k$  is the amount of capital needed for investment.

This primary model used to observe the relationship between student debt and entrepreneurship was a linear probability model where the dependent variable was "self-employment" and the dependent variables included debt at age 25, parent household income, mother and father college education, and all 10 majors identified in the survey. Although the result of the multiple linear probability model identified a negative relationship between student debt and entrepreneurship, the outcome was not statistically significant however, the majors that amplified the negative relationship between student debt and entrepreneurship were business, communications and professional services.

Therefore, in order to observe a more clear-cut relationship between student and entrepreneurship, the linear probability model will be run again, only this time it will be conditional on the majors that amplify the negative relationship between student debt and entrepreneurship. The conditional linear probability model results exemplified the relationship becomes more prominent and more importantly it is statistically significant. The linear

probability specifically states that for every additional \$11.8 a student incurs of debt, that student is 1% less likely to become an entrepreneur. Additionally, Table 4 shows that the constant is 7.82%, meaning that without debt (debt equaling zero), the student has 7.82% chance of becoming an entrepreneur and additionally it is statistically significant

The model used to describe wage-employees occupational decisions was an inter-temporal consumption-savings model derived from Rothstein and Rouse (2007). This basic model is derived using a simple 2-period life cycle model in which utility in each period is derived from a combination of consumption and “job amenities which encompasses anything that makes the job attractive—including hours per week, flexibility of work schedule, and any other measure of “pleasantness” of the job. In order to quantify the model above, this survey uses industry data for non-entrepreneurs mentioned in the sample summary description, we used the same linear probability model to regress debt at age 25, parent household income, mother’s college attendance and father’s college attendance on the 13 industries that were identified in the sample. Table 5 shows that the industries that were statistically significant were: manufacturing, wholesale retailing, Professional Services and Public Administration. Table 5 shows that for each additional \$6.28 an individual incurs in student debt, the individual is 1% more likely to take a job in manufacturing; with an additional \$10.70 an individual incurs in student debt, that individual is 1% more likely to take a job in retail trading; with every additional \$10.09 an individual incurs in student debt, that individual is 1% more likely to take a job in professional services; and for every additional \$5.64 an individual incurs in student debt, that individual is 1% more likely to take a job in public administration. (Negative Correlations)

The primary limitations of the study are the (1) low number of observations, (2) the inability to clearly control for all endogenous variables that contribute to the decision to become

an entrepreneur in order to view the direct relationship between entrepreneurship and student debt (3) the role of tastes and preferences in attending college (or not attending college) for students who are more likely to become entrepreneurs. Addressing and furthermore controlling for tastes is extremely difficult because it is nearly impossible to quantify. In regards to debt and entrepreneurship, tastes play a significant role due to the fact that One deduction that could be made from this study is that undergraduate colleges are good for preparing students to go into the labor force to be wageworkers, however these same institutions are simply not good at teaching entrepreneurship. If this is the case, then students who want to enhance their entrepreneurial ability who logically opt out of going to college since the skills gained through a college education would outweigh the benefits (secure wageworker job) for these individuals. An area for further research will be to find alternative ways to address this conundrum at statistically significant level. Regardless of the limitations, the study did show that the direct relationship between entrepreneurship and student debt varies across different majors. Furthermore, the model exemplifies that student debt plays a deciding factor in recent graduates' employment decisions, usually opting for higher paying jobs (at least in the short-term) as debt accumulation increases.

## **II. Student Debt**

### ***A. Overview of the Current State of Student Debt***

In the last 20 years the primary way to increase human capital, increase social mobility, and increase societal economic growth in the United States has been through attaining a 4-year college education. According to the Current Population Survey's data on education attainment for 2014, 20% of adults 25 and older had earned a bachelor's degree totaling an astounding 150% increase in Bachelors degrees since 1944. The exponential surge in college degrees has been

attributed to the numerous ways in which students can now pay for higher education. In the past, higher education attainment was only accessible to those who could afford it, however, with the introduction of government and private grants and loans more people are now able to afford a college education. This increase in enrollment, however, has also driven up the costs of annual tuition for both private and public higher education institutions. College Board's annual report on college pricing reported that the average annual tuition for a private 4-year institution in 2014 grew by 197% to \$31,231 from \$10,511 in 1980 and the average annual tuition for a 4-year public institution grew by 280% to \$9,139 from \$2,405 in 1980. This sharp increase in college tuition has caused college tuition to be significantly more than an average person's total annual income, causing students to rely on other sources, such as student loans, to fund their college education. As of 2013, the Federal Reserve Bank of New York reported that cumulative student debt has surpassed \$1.2 trillion and is predicted to go up 10% per year thereafter. In fact, student surpassed consumer debt, which is roughly \$900 billion and is also the only type of debt that actually increased after the Great Recession of 2008—2009 (Federal Reserve Bank of New York, 2013). This increase in cumulative student debt has also increased due to the fact that many college graduates have defaulted on their repayment plans. As of 2012, 17% college graduates' loans are in delinquency meaning they are more than 90 days late on a payment. Furthermore, the transition rate of borrowers in repayment from current to delinquent has been rising since 2008 from around 6% to nearly 9% in 2012 (Federal Reserve Bank of New York).

This growing imbalance between the costs of higher education and the capacity of students to bear the increasing debt burdens is referred to as the "Student Debt Bubble". The continuous accumulation of student debt is referred to as a "bubble" within the United States' education system primarily because college tuition costs have risen disproportionately faster than

the job and income reward for attending college (Staff, 2009). For instance, the Pew Research Center published a survey on student loan trends in 2012, which stated that roughly two-thirds of college graduates had outstanding balances in 2011. The survey stated that across the country, 1 in 5 households owe student debt of at least \$26,682 while 10% of these households owe more than \$61,894. Additionally, employment rates were not too promising either—the class of 2011 entered a job market with an 8.8% unemployment wage. With declining job prospects and increasing student debt, the entire generation under 30 is financially indentured, influencing monumental financial decisions like taking out a mortgage, purchasing a car, and attaining a post-graduate degree. In fact, according to a report from the Brookings Institute of Economics Studies, student loan borrowers were 60% to 70% less likely to apply to graduate school (2014). Furthermore, a study conducted by Elbogahdy on the effect of student loans on home ownership reported that high student loan burdens could disqualify students from taking on mortgage debt (2014). Moreover, student loan holders who qualify to take on mortgage debt also do not end up taking out a mortgage due to their high debt-aversion. In addition to postgraduate effects, Baum and O'Malley (2003) reported that student loan burden also impacts the decision to finish an undergraduate degree. According to the 2003 report, 40% of students either did not return to their undergraduate school or transferred to a lower cost school due to student loan debt (Baum and O'Malley, 2003).

### ***B. Standard Life-Cycle Model & Student Debt***

Despite the seemingly burdensome effects caused by student debt, volume of student debt as well as borrowers continues to increase year to year and more importantly, college enrollment has reached an all-time high—clearly students still see an undergraduate degree as a viable investment, primarily in the labor market. Investments always entail an initial cost that the

investor hopes to regain over a period of time. Because of the forward looking nature of investments, labor supply decisions take into account more than just current wages and current labor conditions. In order to correctly model these decisions, there needs to be a framework that incorporates investment behavior through a lifetime perspective. According to basic labor economic theory, workers take on three major kinds of labor market investments: education, training and migration. These three types of investments are referred to as “human capital investments”, a term used by economists to conceptualize and measure the economic value of an employee’s skillset (Ehrenberg and Smith, 2009). Investment in the knowledge and skills of a particular worker can be thought of as having taken place in three stages. The first stage is considered childhood, where most knowledge and skills are acquired via parental resources, cultural environment. Additionally, early schooling plays a significant role in the development of basic language, mathematical skills and attitudes toward learning. The second stage is teenage/young adulthood where the acquisition of knowledge and skills is primarily through full-time participation in high school, college or a vocational training program. The third and last stage is after entering the labor market. Once people enter the labor market workers add to their human capital on a par-time basis by enrolling in on-the-job training, night school, or participation in short-term formal training programs (Ehrenberg and Smith, 2009).

Similar to other forms of investments, human capital investments entails initial costs upfront with the expectation that benefits will accumulate in the future. The costs of adding human capital can be divided into three main categories: out of pocket or direct expenses, forgone earnings, and psychic losses. In relation to accumulating human capital through the education, out of pocket or direct expenses include tuition costs, books, and other supplies; forgone earnings are the earnings the student is losing out on during the time of the investment

since working full-time is almost impossible; psychic costs refer to the level of difficulty or tedious nature some people associate with college-level learning. According Ehrenberg and Smith (2009), for educational investments by workers, expected returns are in the form of higher future earnings, increased job satisfaction, and greater appreciation for non-market activities.

In order to calculate the benefits of an investment over a period of time, future benefits must be discounted. This states that, all else equal, benefits received in the future are worth less than an equal amount of benefits received in the present. From the consumption perspective this is true because, if people plan to consume their benefits, they prefer to consume the same benefits now because they are guaranteed enjoying the benefits whereas if they choose to wait to consume the same benefits, due to the uncertainty of the future they could potentially jeopardize maximizing their full benefits. From an investment point of view, this also holds true because if people want to invest their money instead of consume it, they can earn interest on the investment and grow those funds in the future. The present value of a stream of investments over a period of time is calculated using the following model:

$$\text{Present Value (PV)} = \frac{B_1}{(1+r)^1} + \frac{B_2}{(1+r)^2} + \dots + \frac{B_T}{(1+r)^T}$$

where  $r$  is the discount rate which represents to the uncertainty of future benefits,  $T$  is time in years and  $B$  represents yearly benefits. This model of human capital assumes that workers are utility maximizing agents and therefore compare their initial costs with the present value of their expected future benefits when making decisions about education. Investment in additional education is worthwhile if the present value of future benefits (PV) exceeds initial costs (C):

$$(PV) = \frac{B_1}{(1+r)^1} + \frac{B_2}{(1+r)^2} + \dots + \frac{B_T}{(1+r)^T} > C$$



There are two ways to ensure that the present value of benefits is greater than the initial costs: straightforward calculation of present value or the internal rate of return. When using the present value, one can specify the value of the discount rate ( $r$ ) and then determine the present value of the benefits and compare to the costs. In the internal rate of return method, which determines the largest possible discount rate that can render the investment profitable. In the first step, the present value of the benefits is set equal to costs in order to solve for the internal rate of return. The internal rate of return is then compared to rates of returns of alternative investments. If the internal rate of return is greater than alternative rates of return, the investment is worthwhile. According to the concept of utility maximization, once the present value of benefits is less than or equal to costs, the person will discontinue their investment in human capital.

The same model can be represented in marginal cost and marginal benefits versus a human capital graph. Marginal costs (tuition and other expenditures) are assumed to be constant and marginal benefits are assumed to be downward sloping, since benefits are being discounted yearly and utility is maximized when marginal costs equal marginal benefits. As can be seen from the graph, individuals with higher marginal costs will acquire lower levels of human capital and similarly, those expect less marginal benefits will also acquire lower levels of human capital.

As mentioned earlier, people who invest in a college education see their future benefits as higher earnings in the future. Therefore, the individual considering college has two choices between earnings represented in the graph produced by Ehrenberg and Smith shown below. Stream A represents the projection of earnings the individual should expect to earn if he simply finished high school. Beginning earnings in this stream rise immediately, however they do not rise very much and flatten out quickly. Stream B represents the projection of earnings if the individual decides to go to college. In this stream, the first four years represent negative income

earnings since the individual will be paying tuition and other expenses followed by a period of time when the college graduate may earn less than the high school graduate. However, following the brief period, earnings dramatically rise higher than the high school graduate's earnings.

Another important note to take into account is that in addition to the negative income incurred during the first 4 years, the college graduate also loses potential earnings also referred to as forgone earnings. In order for the investment in education to be worthwhile, the area of forgone earnings plus tuition and other expenses must exceed the area under the curve of Stream B.

### **III. College Education in the United States**

#### ***A. Demand for College***

The demand for a college education, derived from the number of high school seniors who enroll in a 4-year institution, has significantly increased over the past two decades. There are four main concepts that influence the demand for college education. The first is that people who choose to attain a college education are forward-looking individuals who value future earnings over present earnings. Present-oriented people, as described by Ehrenberg and Smith, would have extremely high discount rates in our basic model for human capital investment and thus would make decrease the value of the benefits at a much faster rate causing costs to exceed present value of the future benefits, making the investment unattractive. The second prediction is that college students tend to be younger since they would have a larger present value of total benefits relative to older people since younger people would have a longer work life to maximize their benefits. The third predication of the model says that a decrease in initial costs will increase college attendance, if all else is held equal. Costs in human capital, especially in education, are extremely high. The major costs of this type of human capital investment come from forgone wages and from cost of net tuition. When discussing the effects of costs, the notion of access to

funds comes into play when dealing with students who cannot afford the initial costs of acquiring a college education. Although some student finance their college education through scholarships and grants, other students must bear the costs of taking out loans which usually incur interest over time. This means that costs vary across the board and furthermore, for students who do not have access to funds to finance their education, costs can be significantly more expensive. Students who do not have access to funds or who find it extremely expensive to obtain those funds are considered “credit constrained”.

### ***B. The College-Wage Premium***

The fourth and final prediction is that college education’s benefits are in the form of a positive wage differential also referred to as the college wage premium. There are two main theories that explain this college premium. The first theory, pioneered by Theodore W. Schultz and further developed by Gary Becker in 1970s, argued that the college wage premium increases because, by acquiring a college degree, the worker becomes more productive (Becker, 1972). The second theory, developed by Michael Spence, argues that a college degree signals the qualities of a productive worker, like a strong work ethic, dependability and intelligence, implying that the college degree itself does not add anything to the worker’s productivity. These two theories have driven the assessment of higher education as an investment from two different perspectives. Over the past two decades, the demand for a college education has been positively related to the increase in expected lifetime earnings that a college degree allows, however in reality, the expected benefits for any individual are uncertain since a college degree does not guarantee higher earnings. This higher expectation in lifetime earnings is called the college wage premium. The Federal Reserve Bank of New York reported that during the period between 1970 and 2013, the average annual income for individuals with a bachelor’s degree was \$64,00 and for those with an associate’s degree earned \$50,000 per year, while those with only a high school

diploma earned only \$40,000 per year. These statistics yield that on average, a person with a bachelor's degree earns 60% more than a person without a degree per year where the premium for a person with an associate's degree earned 21% more than those with only a high school degree (Federal Reserve Bank of New York, 2014).

Although the most recent data suggests a substantially high college wage premium, it has actually fluctuated throughout the years and in fact was not always rising. Between 1970 and 1982, average wages for college graduates declined by 8%, which was nearly double the decline in wages for people who only had an associate's degree and a high school degree. After the 1980s all the way through the 1990s wages of college graduates sharply increased due to the technological advances that occurred during the same period, which required high-skilled labor, allowing college degrees to be more productive in the labor market. During this time period, the college wage premium rose to almost 80% (Federal Bank Reserve of New York). Fast-forward two decades and although the college wage premium is still prominent, it is clearly not as high as it was in its peak. Coupled with the severely depressed labor market that occurred during the Great Recession of 2008—2009 and the total economic value has been under sever scrutiny recently.

Another aspect that has been fueling the questioning the profitability of a college degree has been the exponentially increasing costs of college tuition over the last two decades. As shown below, the cost of a 4-year college education, for both private and public institutions has exponentially increased since the 1980s. In fact, over the past two decades, college tuition has been increasing faster than the rate of inflation (Lorin, 2014). Figure 1 shows that, tuition has been increasing faster for 4-year private institutions than for its public counter parts. The combination of the exponential rise of the cost of college tuition and the staggering labor market

has evidently placed the high school graduates in a zero-sum position, causing them to take on enormous amounts of student debt to try and remain competitive in the labor market (Kamenetz, 2006).

Overall college enrollment has been rising, totaling 10.5 million enrolled college graduates in 1980 to 17.6 million in 2009. The increase in enrollment is concurrent with the increasing wage differential between college graduates and non-college graduates. However, the annual volume of federal loans increased from 2.3 million loans to 10.9 million in 2009, clearly increasing a lot faster than college enrollment (Avery and Turner, 2012). From the standard lifecycle model, student debt has only an income effect. This is calculated by dividing total student debt over total lifetime earnings discounted to their present. This value turns out to be a little more than 1% signaling that the income effect of student debt is not the primary reason for concern. As discussed earlier, the introduction of financial aid in the form of student loans directly helps students who come from low to middle-income families, who would otherwise be considered “credit constrained” due to the fact that they would not have access to funds in order to finance their higher education without them. Probably the most evident effects of student debt burden can be seen in the manifestation of “debt aversion” among this group of people. Several empirical studies have found that students who relied on student loans to finance their college education became debt averse, meaning that to this group of individuals, every additional dollar of debt reduces utility (Burdman 2005, Callendar and Jackson, 2004, and Field 2005), meaning that they will try to repay their debt more quickly. However, because their income will be spent on repaying loans, they will likely forgo purchases of consumption goods, making debt more constraining than it actually is. In addition to consumption effects student debt can also dissuade students from borrowing in their early career causing a disruption in the supply and demand of

capital markets (Rothstein and Rouse, 2011). From our standard lifecycle model discussed earlier, college graduate's income is a lot lower than their average lifetime annual income. The unconstrained college graduate would prefer to borrow in order to finance his consumption behavior, however the constrained college graduate may be debt averse or simply unqualified to borrow. Rothstein and Rouse (2011) found that the constrained college graduate would try to minimize these effects through job choices. Therefore, not only does debt affect "adulthood" transitionary purchases (mortgages, cars, etc.) that occur later in life, but it also affects early-career choices that tend to happen right after graduation.

### ***C. Introduction to the Relationship Between College and Occupational Choices***

In the early 2000s an elite, wealthy, private university, which will be referred to as "Anon U", implemented a "no loan" policy in their incoming students' financial aid packages. Specifically, this "no loan" policy meant that after each student's expected family contribution (EFC) and scholarship amount was computed and compared to the cost of total tuition, any remaining difference that would otherwise have been financed through direct student loans, would be covered by grants (Rothstein and Rouse, 2011). In 2011, Jesse Rothstein and Cecilia Elena Rouse exploited the differences in Anon U's graduating class before and after the implementation of the "no loan" policy in order to examine the differences in post-graduate employment from students who graduated with different "debt positions". It is important to note that the university's primarily goal for the implementation of the policy was not to observe differences in post-graduate employment, but rather to motivate student from disadvantaged backgrounds to apply and to enroll into the university without the burden of costs. Rothstein and Rouse's primary findings were that students who graduated before the policy was put in place were more likely to take high-salary jobs and roughly 27% less likely to take low-salary public

interest jobs. While the college wage premium is still relatively high, wages for high school graduates have significantly narrowed, creating a nearly zero-sum situation for this segment of individuals.

## **IV. Entrepreneurship**

### ***A. Entrepreneurship as a Career Choice***

Baum and O'Malley (2003), Kamenetz (2006), and Minicozzi (2005) suggested that in addition to post-graduate employment student debt also affects college major decisions. Rothstein and Rouse's findings supported the same claims. Anon U's findings suggested that prior to the "no loan policy" reform, more students chose majors that were in specific, usually technical, career-oriented fields.<sup>1</sup> One specific employment field that has not been studied in relation to student debt is its effect on entrepreneurship. Entrepreneurship in the United States has been heavily romanticized over the past two decades due to the wildly successful technology firms like Google, Amazon, PayPal, Twitter, Facebook. However, even outside the technology sector, entrepreneurship is considered to be an important vehicle for economic development through employment effects as well as welfare effects. In the most basic sense the role of entrepreneurship in the economy may seem straightforward: entrepreneurs create new business, which create new jobs, which increase competition, which increase overall productivity. In this basic scenario, high levels of entrepreneurship translate to high levels of economic growth. However, entrepreneurship can be also be seen as quite the opposite. Observing entrepreneurship solely as "self-employment", high levels of entrepreneurship could also a sign of caution. For example, high levels of entrepreneurship can indicate unfavorable trends environment wage-employment or pro-entrepreneurship policies in place, which prevent young start-up companies

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from becoming fully-fledged companies. In this scenario, high levels of entrepreneurship would, intuitively, be correlated to downturn in the economy or lagging in policy development.

The contrasting conclusions come from the two broad types of entrepreneurship: necessity and opportunity entrepreneurship. Necessity entrepreneurs are those who become entrepreneurs because they do not have a better option. Opportunity entrepreneurs are those who voluntarily seek out and explore potential opportunities for new products or services in areas that are deemed untapped or under-tapped and therefore have high potential for new business opportunities. Data that was collected from the Global Entrepreneurship Monitor (GEM) showed that necessity entrepreneurship creates no economic value, while opportunity entrepreneurship creates positive economic value (Acs, 2006). From a development economics lens, there are three stages in economic development. The first stage starts out with an economy that is highly dependent on agriculture and small-scale manufacturing. In the second stage, as countries begin to develop, the economy shifts from a small-scale production to a large industrial economy, primarily focusing on large-scale manufacturing. In this stage levels of entrepreneurship go down due to the fact that through the expansion of manufacturing companies, managerial needs are higher making the benefits of working for a firm greater than starting a small business. In this stage, the firm size gets bigger, whoever Koellinger and Roessler (2009) point out that the developing stage, the growing size of the average firm is a function of an increasing economy if capital and labor substitute. Koellinger and Roessler (2009) explain that when capital and labor are substitutes, an increase in capital increases the returns from working and decreases the returns from managing, implying that the marginal manager find that they can make more money while being employed by someone else than if they were self-employed. Another this could be thought about is that increases in capital stock through private enterprises, foreign direct



investment, or government ownership increases the returns to wage work making the relationship to entrepreneurship and economic negative during the second stage of economic development. In the third stage, large-scale manufacturing plateaus in terms of growth and profitability as an entire industry, the economy shifts to a service-based economy. Therefore in this stage a surge of start-up firms begin to form in order to create a new, evolving market offering services primarily, that are not existent. This stage is therefore marked by an increase in entrepreneurial activity. This is because service-based economy has more opportunity for entrepreneurship because it requires innovation and improvements to common technology, which require creativity. Technological improvements that are focused on breaking barriers to communication, expansion, collaboration, and of physical access are key in any economy in the third stage. This increase, decrease and increase behavior of entrepreneurship creates a U-shaped graph as seen in Figure 2.

### ***B. Entrepreneurial Frameworks and Conditions***

During the second stage in economic development large corporations have a national effect on overall economic growth and are primarily dependent on general business conditions, usually affecting the country where the company operates. However, as an economy moves towards the third stage, individuals begin to experience benefits of becoming entrepreneurs exceed benefits of being a wageworker. In the third stage, the cost-benefit analysis these potential entrepreneurs are performing are based on additional characteristics within the existing business instead of just solely focusing on the macro-environment, referred to as entrepreneurial conditions. Traditionally, the two main conditions include a country's ability to promote start-up companies and the skills and motivation of those who wish to go into business themselves. It is important to note the natures of skills and motivation are contrastingly different. Skill is the natural ability that one is born with while motivation can be seen as the additional skills that one

looks for to improve, also known as the investment in skill. Investment in skill can take a wide range of forms with the most important ones being formal education and on- the-job-training. For example, if a person is innately born with great mathematical skill in order to enhance that skill he invests in a college a degree and majors in something mathematically heavy, like engineering. If along the way this engineer figures out that he is extremely good at creating new products, however without any knowledge of the market or consumer needs, the device may actually have no business value. The creators who succeed in entrepreneurship are those can come up with something that is not only technically sound, business relevant as well. This implies that having multiple skills is necessary to become a successful entrepreneur because having more skills allows you to understand the full picture and therefore create better and more efficient innovation. In this scenario, the argument is that individuals who want to be entrepreneurs invest in a broad range of skills, making the generalists versus specialists. On the other end of the spectrum, there are those who believe that effective entrepreneurship can only be achieved through specialization. However, Lazear (2005) empirical sampling on a group of Stanford University graduates found that those who are going into any job, entrepreneurship or wage-employment, individuals with a broader range of skills acquired through investment or endowments are more likely to be entrepreneurs.

### ***C. Entrepreneurial Risk Conditions***

In addition to the level of skill, there are also other risk factors that contribute to individuals deciding to become entrepreneurs, like risk. The discussion of risk is important in the decisions for entrepreneurship for two reasons: an entrepreneur cannot be successful without taking risk however, an entrepreneur must also consider risk constraints involving finances. The discussion of risk and entrepreneurship theory comes from Herbert and Link (1982 and 1989), Binks and Vales (1990), Wennekers and Thurik (1999) and Venkataran (1997, 2000) where they

heavily discuss the importance of the presences of variation and quality of entrepreneurial opportunities either through product selection or factor markets and, at the same time, the presence of people who carry entrepreneurial characteristics (Petrakis, 2004). As explained by Baumol (1968) and Barreto (1989), the neoclassical theory of economics by its nature does not include a role for entrepreneurs as established in firm theory, where firms and corporations exist and make decisions to maximize profit. Firm theory also holds that businesses interact with the market to determine pricing and demand and then allocate resources according to models in order to maximize profits as well. It's important note that the theory of the consumer is also closely related. Instead of profit maximizing agents, the basic theory of the consumer states that consumers strive to maximize overall utility. However, Baumol (1968) and Barreto (1989) state that if firm theory and consumer theory hold, then everyone has perfect information and therefore everything is pareto optimal. More importantly, if an economy is in perfect competition, then there are no profit-maximizing opportunities for the entrepreneur (Petrakis, 2005). If this is the case, then there is no room for opportunities or for improvement because everyone would have perfect predictability. Therefore, the overall nature of an economy that supports entrepreneurship must be filled with uncertainty and must make it easy for people with entrepreneurial traits to act on these opportunities to improve this. An uncertain economy therefore gives rise to opportunities that entrepreneurs can maximize. With that being said, one of the most crucial characteristics of the potential entrepreneur is low risk-aversion and low fear of uncertainty all the while being able to hedge risk while still taking advantage of the risk to yield high rewards, in this case profits.

#### ***D. Financing Constraints***

Besides internal risk, entrepreneurs also face external risk factors like debt capacity. Debt capacity is defined as the ability to borrow. Debt capacity is an important factor in entrepreneurship because although entrepreneurs may use debt to finance their ventures, there comes a point where the amount of debt borrowed does not increase the value of the firm. The debt capacity of the firm measures the amount of debt a firm or individual can borrow up to the point where the value of the firm does not increase. The most prominent constraints a potential entrepreneur has to deal with are those having to do with access to capital to finance their ventures. William Kerr and Ramana Nanda (2009) explain that relationship between financial intermediaries and the firms they service play an important role in the tightening or softening of financial constraints entrepreneurs face. In developed financial markets, like the United States, financial intermediaries largely influence which entrepreneurial projects get funded and which do not. Often, financial intermediaries also play a role in monitoring projects past the initial funding process. Financial intermediaries base their decision whether or not to fund a project based on the information of the firm. However this process is neither cheap nor easy and it becomes more expensive and more difficult to assess a startup companies since they are new and usually privately held at the beginning stages. Established companies have three main advantages when trying to access capital: they have history of audited financial statements, they have greater value in collateral to offer against loans, and they have the potential ability to “partially fund expansion through retained earnings” (Kerr and Nanda, 2009), meaning there are welfare benefits that a larger, established firm can provide that go beyond its own profitability. Entrepreneurs, even those with viable ideas that have been well received in the market place and more importantly those that are profitable, are a significant disadvantage because intermediaries were unable to evaluate them correctly. This is disadvantage entrepreneurs faced is referred to as

information asymmetry. Information asymmetry, combined with limited resources put significant financial constraints on potential entrepreneurs (Kerr and Nanda, 2009).

The institutional environment does not account for all financial constraints—in fact another significant component of entrepreneurial financial constraints is the entrepreneur's personal wealth. Evans and Jovanovic (1989) established a model to support the theory that a potential entrepreneur's resources and his propensity to become an entrepreneur are positively correlated. In their model, Evans and Jovanovic, made the maximum amount of money a potential entrepreneur could borrow, a function of the collateral the individual can guarantee, which in turn, is a function of personal wealth. If the amount of money a potential entrepreneur needs to borrow is less than or equal to the amount of money needed to start the project, this potential entrepreneur is said to be unconstrained (Evans and Jovanovic, 1989). In other words, since it holds that the maximum amount of money the potential entrepreneur is able to borrow is a function of his personal wealth, if the amount he needs to fund his project matches his ability to borrow it means his personal wealth is sufficient and therefore is not financially constrained. On the other hand, if the cost of the project exceeds the amount the potential entrepreneur can borrow, he is financially constrained creating either a sub-optimal investment for the project or none at all. An important take away from Evans and Jovanovic's model is that since returns to entrepreneurial projects are a positive function of the investment, the projects that would have been profitable for an unconstrained entrepreneur become unprofitable for a constrained one. This positive correlation between personal wealth and entrepreneurship can also be taken as a failure in the markets since its main conclusions imply that highly able and well educated but less wealthy potential entrepreneurs are not able to become full-fledge entrepreneurs simply because they cannot afford to fund their ventures. Although this model provides great insight in

financial constraints for entrepreneurs, it is important to address some flaws. Blanchflower and Oswald (1998) and Holtz and Eakin (1994 ) argue that the positive correlation between personal wealth and entrepreneurship may be endogenous. For example, an individual with high ability is more likely to generate savings since high ability usually means higher productivity, which is translated into higher wages. Higher amount of savings translates into greater personal wealth and if people with greater personal wealth are more likely to become entrepreneurs, the observed positive correlation between personal wealth and entrepreneurship reflect these unobserved attributes.

## **V. Data**

### ***A. Survey Description and Sample Selection***

The empirical objective is to estimate the relationship between student debt (individual's debt shock) and entrepreneurship, described as self-employment. In order to address unobservable, endogenous attributes mentioned in Evans and Jovanovic's model, this paper will be using inter-temporal savings and consumption paths of entrepreneurs while observing shocks of debt rather than shocks of wealth. This paper will be using data from the 1997—2011 National Longitudinal Survey of Youth (NLSY97) to assess the effect of student debt (debt shock) on entrepreneurship. The data surveyed 8,984 American youth respondents starting in 1997. All of the respondents were born in 1980 through 1984, meaning they were ages 12 through 17 at the beginning of the survey. Up until 2011, the youth were interviewed 15 times. The purpose of this survey is to track the transition of from high school to college to the work place. The NLSY97 collected relevant data about respondents' education and employment history patterns. Demographic information, marriage information, employment history, education history, income history, and student debt history were all collected in a panel module on an annual basis. Round 1 of the NLSY97 included one parent questionnaire that contained

information about the sampled youth's parents including parents' marriage history, education history, employment history, and income history. Because there were four different cohorts (1980—1984) in the panel data, the relationship between student debt and entrepreneurship was analyzed from the base line at age 25.

In regards to education history 24% out of out of the 8,984 respondents completed a 4-year college education, only 4% complete a master's degree, approximately 1% completed a professional degree, and only .16% completed a PhD. By age 25, 19% of respondents had graduated from a 4-year higher-education institution. Up until the latest year observed (2011) respondents attended 13 different higher-education institutions. There were five types of institutions: public, private for-profit, private not-for-profit, parochial institutions and "other". 49% of respondents who graduated college by age 25 received a degree from a public institution, 14.93% graduated from a private not-for-profit institution, 10.99% graduate from a for-profit private institutions and the remainder of students graduated from parochial or "other" institution. In total there were 28 possible different majors that a respondent was able to graduate with. These 28 different majors were then categorized in to STEM, agriculture, architecture, humanities, social sciences, business, and communications. Of the respondents who graduated college by age 25, 19% were social sciences majors, 18.8% were business majors, 14% were STEM majors, 7% were humanities majors, 5% were communications majors, 1% were architecture majors, and 0.82% were agriculture majors.

In regards to debt, respondents were asked the total amount borrowed each semester of school for the given year. Student debt data was then aggregated for each year starting from 1997 up until 2011. Total debt was separated into 5 buckets. The first bucket is any debt that is less than \$1000, then second buck is anything that is between \$1000-\$5000, the third bucket is

anything between \$5,001 and \$10,000, the fourth bucket is anything between \$10,001 and \$25,000, the fifth bucket is anything that is \$25,000-\$50,000 and the sixth bucket is anything greater than \$50,000. Because the baseline year for analysis is age 25, debt amounts were taken up to the year 2005 for those born in 1980, 2006 for those born in 1981, 2007 for those born in 1982, 2008 for those born in 1983 and 2004 for those born in 1984.

In regards to self-employment, the first time anyone in the sample identified a full-time job was in the year 2000. Since 2000, respondents were asked whether or not they currently identified as “self-employed”. Again because the baseline year for analysis is age 25, self-employment was analyzed in 2005 for those born in 1980, 2006 for those born in 1981, 2007 for those born in 1982, 2008 for those born in 1983 and 2004 for those born in 1984. Cumulatively, 8.16% of respondents identified as self-employed by age 25. 7.60% respondents were self-employed by 25 and graduated from college, 8.38 percent of respondents were self-employed by 25 and hadn’t received a college degree<sup>2</sup>. Figure 3 shows self-employment trends from 1997—2011 for the general population (blue line), non-college graduates (orange line) and college graduates (grey line). From the graph it is evident that self-employment rates for the general population and non-college graduates follow each other relatively closely, while self-employment rates for college graduates experience augmented behaviors of increase and decrease when the general population experience increases and decreases in self-employment rates.

Similar to self-employment, the first time anyone in the sample identified a full-time wage job was in 2000. Overall there were 13 industries individuals identified as having full-time jobs within. The industries identified were agriculture, utilities, construction, manufacturing,

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<sup>2</sup> For this group, the highest degree attained was either none, GED, High School Diploma or 2-year Associates Degree.



information, wholesale trading<sup>3</sup>, retail trading<sup>4</sup>, information and communication, Finance/Insurance/Real Estate, Entertainment, Professional Services<sup>5</sup>, Public Administration, Military and Education. Roughly .07% of college graduates who were wageworkers worked in the agriculture industry, .23% worked in the utilities industry, 3.10% worked in the construction industry, 5.84% worked in the manufacturing industry, 3.27% worked in the information communications industry, 2.28% worked in the wholesale trading industry, 11.80% worked in finance/insurance/real estate, 15.54% worked in the entertainment industry, 18.63 worked in the professional services industry, 4.64% worked in the public administration industry, .047% were active in the military and 34.64% worked in the education industry.

### ***B. Sample Summary of Demographic Characteristics***

Table 1 presents sample statistics for the five buckets of debt buckets which are mutually exclusive: less than \$1,000, \$1001-\$10,000, \$10,001-\$25,000, \$25,001-\$50,000, and greater than \$50,000. The table shows that, the majority of people who took student debt in each respective category were “Non-Black, Non-Hispanic People”: of the people who borrowed debt that less than \$1,000 79.56% were non-Black/non-Hispanic; of the people that borrowed between \$1,000-\$10,000, 70.82% were non-Black/non-Hispanic; of the people that borrowed between \$10,000-\$25,000, 65% were non-Black/non-Hispanic; of the people that borrowed between \$25,000-\$50,000, 62% were non-Black/non-Hispanic; of the people that borrowed more than \$50,000, 66.67% were non-Black/non-Hispanic. Hispanic people borrowed significantly less across all five categories. Furthermore, the percentage of people who borrowed in each category that were Hispanic was relatively constant across all five categories. Although the percentage of Black

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<sup>3</sup> **Wholesale Trading** is defined as a “form of trade in which goods are purchased and stored in large quantities and sold in batches of designated quantity, to resellers, professional users or groups, but not to the final customers (Organization for Economic Co-operation and Development, 2015).

<sup>4</sup> **Retail Trading** encompasses “establishments, engaged in retailing merchandise...and rendering services incidental to the sale of merchandise (Bureau of Labor Statistics, 2015).

<sup>5</sup> **Professional Services** are identified as occupations that require special training in the arts of sciences including, doctors, lawyers, dentists, architects, or engineers.

people who borrowed across all debt categories was less than the percentage of Non-Black/Non-Hispanic, the percentage of Black people who borrowed increased in the larger debt categories.

According to Table 1, public school graduates have taken out most of the student across all five categories. However, it is important to note that the maximum amount of debt taken out by public school graduates was \$50,000 as 0% of the people who borrowed student debt were public school graduates. One of the reasons why public graduates made up for the majority of all borrowers across the first four debt categories could be because there are a lot more people who attend public institutions than private institutions. On average, public institutions are less expensive and are even less expensive for in-state students. According to the most recent data published from College Board, the average tuition cost (excluding room, board) for a 4-year public institution in the 2014-2015 school year was \$9,139 per year. College Board also reported that total costs (tuition, fees, room and board) for a 4-year public institution were \$18,943 per year. Due to the low costs of a public institution (relative to private institutions), it makes sense that respondents of the survey who graduated from a public institution accounted for 0% of people who borrowed more than \$50,000.

Graduates from private universities were divided into graduates from non-profit and for-profit universities in efforts to see if there were any differences. According to Table I, of the students whose debt balances were less than \$1,000, only .05% of them accounted for graduates from for-profit private institutions. Additionally, graduates from for-profit universities make up the more of the percentage of borrows as debt levels increase where 21.75% of those who took out loans between \$25,000-\$50,000 and 50% of those who took out debt greater than \$50,000 were graduates from for-profit public schools. Although, borrowing patterns for non-profit private institutions was more spread out on the lower end of the borrowing tail (40.25% of those

who borrowed debt less than \$1,000 were from non-profit private institutions) in comparison with for-profit private institutions, the remaining 50% of graduates who borrowed more than \$50,000 were non-profit institutions. The higher borrowing levels for graduates of private institutions could be explained by the significantly higher tuition costs for private institutions. The most recent data collected from the College Board stated the average tuition for a private institution (no distinction between for-profit and non-profit) was \$42,419 per year. There is value in differentiating between for-profit and non-profit universities due to the nature of incentives in regards to running each type of institution. For-profit universities' primary incentives are financial; typically, those running these types of schools are external shareholders that do not include students or faculty. In a non-profit private institution, the primary incentive is the success of the student body; typically, the Board of Trustees and various faculty members run the school. Due to the difference in financial incentives, for-profit universities generally tend to have less scholarships as roughly 90% (on average) of revenues collected by for-profit universities are from college tuitions (National Association for College Admission Counseling, 2015). Additionally, on average, tuition for for-profit private universities is higher than tuition for non-profit universities. Differences in costs and financial incentives may be translated into borrowing higher amounts of debt in order to finance education at a for-profit private institution.

### ***C. Sample Summary Education Characteristics***

Table 2 presents statistics for ten different categories of majors: agriculture, business, communications, education, fine arts, health<sup>6</sup>, humanities, professional majors<sup>7</sup>, social sciences, and STEM. Each major was then analyzed with respect to average debt per bucket of each

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<sup>6</sup> For the purposes of this analysis, health incorporates all majors related to health that are neither pre-medical nor pre-dental as they are accounted in "professional services" majors.

<sup>7</sup> For the purposes of this analysis, professional majors include: architecture, pre-law, pre-med and pre-dental.

major. Agriculture, education, humanities and professional majors had were the least represented across all debt categories. It is important to note that professional majors, like pre-medical, pre-dental and pre-law, may be associated with higher costs, this analysis does not take into consideration loans taken out for any type of graduate school. The majors that were significantly represented in each debt category were social sciences, STEM, and business. Although fine arts majors are minimally represented across the first four debt categories, fine arts majors account for 50% of the people who borrowed more than \$50,000; the remaining 50% of people who borrowed more than \$50,000 were STEM majors. To some extent, Table 2 shows that technical majors, like STEM and business borrow more debt on average. Majors with a focal industry, however, not overwhelmingly technical like education, health, and communications borrow less on average. Social science majors include fields of study like economics, history, psychology, and political science also tend to borrower more on average and relatively consistent across all debt categories. The break down of majors is relevant to this analysis because at the undergraduate level, employers primarily filter full-time recruitment according to majors. Students begin to learn about employment opportunities across different majors by their sophomore year and often make academic decisions (like changing a major) based on better-perceived employment prospective. Additionally, majors serve as a qualitative way to observe the skillset of a recent graduate in the field, which as discussed in the section regarding entrepreneurship, is extremely important in (1) determining whether or not to become an entrepreneur and (2) serve as a benchmark for assessing the success rate in the event the individual chooses to be an entrepreneur.

## V. Results

### A. A Graphical Example

Figure 4 shows the relationship between percentage of entrepreneurship and debt categories. On average, the graph shows presents a negative relationship between the percentages of entrepreneurs as debt categories increase. Because this sample only observed college graduates by the age of 25 for the primary analysis, the sample decreased from 8,984 to 1,712; from those 1,712 only 134 (7.8%) were self-employed at the age of 25. Figure three shows that although the overall trend line is negative, there is one shock of increase that occurs at during debt category 4 (borrowed between \$25,000-\$50,000). It is important to note that this Figure represents those whose highest degree attained was a bachelor's degree in efforts to avoid skewed responses from respondents who borrowed a significant amount of debt to attend medical, dental, or law school and went on to open their own practices.

Figures 5 and 6 show how wageworker's decision vary across the 5 debt categories. It is especially interesting to note that the percentage of graduates who chose to work in industries like utilities, manufacturing, and professional services increased as debt amount increased. In contrast, the percentage of individuals who work in industries like information communication, finance, entertainment, and education decreased as debt categories increased. The industries above can be separated into two categories at the entry level: generic skillset need and low-paying industries. The industries that require a generic skill set at the entry level are finance<sup>8</sup>, information communication and entertainment. Most of these jobs require a well-rounded set of skills provided by an accredited four-year university. Jobs that require generic skill often pay

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<sup>8</sup> Most jobs in finance available to undergraduates involve "back office" jobs like operations, regulatory compliance, anti-money laundering, book keeping etc. Jobs like accounting, and investment banking yield higher salaries than average, but it's important to note that these are outliers so for the purposes of this study jobs in "finance" will refer to the average entry-level job and wages.

lower than average and are therefore less attractive when debt accumulation is significantly high. Jobs in education for recent graduates are relatively low-paying as well. Education salaries do increase however this requires experience and additional graduate schooling. The downward sloping trend in education employees as debt increases, signals that as debt increases, students are less likely to take “publicly beneficial jobs” like education. However, it is important to note that although jobs in education, government, and non-profit sectors are for the “good” of society, these jobs have null effect on the economy. On the other hand, corporate jobs positively influence the economy. Therefore, another interpretation of this phenomenon could be that although student debt seems to reduce the number of “do-gooders”, it could serve a specialized purpose in the economy. In this case, student debt could arguably be seen as the factor that keeps students’ skin in the game of employment and motivates them to attain better job prospects that serve individual needs and the economy’s needs as a whole. The other argument, of course is that this system functions for wageworkers, however puts a limit on potential entrepreneurs who could be doing financially better for both themselves and for the economy as well.

### ***B. The Decision to Become an Entrepreneur***

An individual to choose to pursue entrepreneurship over wage-employment ( $w$ ), if it yields a higher payoff than wage-employment ( $y$ ), represented as net income. In other words, a person chooses to become an entrepreneur if net income from self-employment is greater than income from wage-employment. The model for wages is:

$$w = \mu x_1^\lambda x_2^\lambda \xi^9$$

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<sup>9</sup> This model was adopted from Evans and Jovanovic’s (1989) model outlining entrepreneurial choice for constrained individuals. The model in this paper includes a variable for major because of the perceived effect majors have on entrepreneurship as well.

**Original Citation:** Evans, D.S., Jovanovic, B. (1989). An Estimated Model of Entrepreneurial Choice under Liquidity Constraints. *Journal of Political Economy*. Vol. 97, No. 4 (Aug., 1989), pp. 808-827.

Here,  $\mu$  is the constant,  $x_1^\lambda$  is the worker's previous work experience as a waged worker,  $x_2^\lambda$  is the worker's education, and  $\xi$  is the disturbance independent across workers (Evans and Jovanovic, 1989). Using Evans and Jovanovic's (1989) model again, entrepreneurial earnings quantified as:

$$y = \theta k^\alpha \varepsilon$$

In the original model,  $\theta$  represents "entrepreneurial ability" however, for the purposes of this paper,  $\theta$  will take into account previous jobs worked and major in school since Table 4 shows that there is a relationship between entrepreneurship and college majors. Additionally, because recent graduates are filtered through their major when choosing their first college job, college major actually does turn out to be significant. Here,  $k$  represents the amount invested in the business, and  $\varepsilon$  is the disturbance. Therefore, an entrepreneur's net income is:

$$y + r(z - k)$$

Here,  $r$  represents one plus the rate of interest,  $z$  is the amount of personal wealth, and recall  $k$  is the amount of capital needed for investment. For simplicity purposes, we will assume that the individual can only borrow up to his personal wealth. Therefore if  $z < k$ , the individual is said to be constrained. Student debt decreases personal wealth, making the individual who borrows more debt slightly more constrained. This model is evidently static, however it can be used as a dynamic model that represents future decisions as well, particularly related to occupational choices.

### ***C. A Model for Debt and Consumption-Savings Decision***

The education one chooses to invest in directly relates to the amount of debt one takes, and as discussed earlier, the two primary effects of student debt are debt aversion and credit constraints. This basic model is derived using a simple 2-period life cycle model in which utility in each period is derived from a combination of consumption and "job amenities which encompasses

anything that makes the job attractive—including hours per week, flexibility of work schedule, and any other measure of “pleasantness” of the job. Since utility cannot be quantified directly, Rothstein and Rouse approximated the dollar value of utility by calculating the dollars of salary forgone on the upper bound (higher level of amenities) of choices so that a job offering  $a$  amount of amenities, the job offering’s salary will be  $w-a$ .

According to the two-period model economy, a graduate starts with debt and works for two periods. As we described above, the utility for each period is calculated by the consumption of that period ( $c_t$ ) and job amenities for each period ( $a_t$ ) making total utility for each period as  $U_t(c_t, a_t)$ . Lifetime utility (for both periods) can be represented as follows:

$$U_t(c_1, a_1, c_2, a_2) = u^1(c_1, a_1) + \frac{u^2(c_2, a_2)}{(1+r)}$$

In this case, the indebted student is constrained primarily by income and debt, which can be represented as:

$$c_1 + \frac{c_2}{(1+r)} < w_1 - a_1 + \frac{w_2 - a_2}{(1+r)} - d = Y^1 + \frac{Y^2}{(1+r)} - d^{10}$$

Here,  $w_t - a_t$  is salary,  $Y^t$  is real earnings, and  $d$  represents debt. Using the two-period model allows one to observe the combination of consumption in periods one and two that may be achieved using the wages in year 1, also known as intertemporal budget constraint. The case above describes the case where debt only affects income, however as discussed above, the debt to lifetime realized earnings only accounts for a little over 1% and therefore, the actual impacts come from the variation in debt constraints. The next step is to assess the student’s debt position at the end of the first period. Debt position ( $D$ ) is represented as:  $D = d + c_1 - Y_1$ . In the ‘Anon-U’ quasi experiment for evaluating the effect of student debt on occupational choices, Rothstein

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<sup>10</sup> Rothstein, J., Rouse, C.E. (2007). Constrained After College: Student Loans and Early Career Choices. *Journal of Public Economics*. vol. 95(1), pages 149-163. Retrieved from: <http://www.nber.org/papers/w13117.pdf>



and Rouse found that upon maximizing debt position,  $D^*$ , the upper bound drives a wedge between marginal utility in periods one and two. The degree of the wedge can be calculated by:  $D^* - d$ . From this model it can be showed that if  $D^*$  is low enough, increases in debt ( $d$ ) will reduce consumption  $c_1$  and amenities in period one and will increase wages in year period one that would have not have happened without the intertemporal budget constraint.<sup>11</sup> Using the same model we can also see that the second effect of student debt, debt aversion, also drives the same wedge between marginal utility for periods one and two caused by the negative effect of debt (due to debt aversion) held at period one on lifetime utility independent of the level of consumption or amenities in each period.

#### ***D. Linear Probability Model for Entrepreneurship***

The first step in trying to quantify the relationship between student debt and entrepreneurship was to run a linear probability model including parent household income, and all 10 majors:

$$Y = \alpha + \beta_1 x_1 + \beta_2 x_2 + \beta_3 x_3 + \beta_4 x_4 + \beta_5 x_5 + \beta_6 x_6 + \beta_6 x_6 + \beta_7 x_7 + \beta_8 x_8 + \beta_9 x_9 + \beta_{10} x_{10} + \beta_{11} x_{11} + \beta_{12} x_{12} + \mu_i$$

Table 3 shows that there is, in fact, a negative relationship between student debt and entrepreneurship, however it is important to note that is it not statistically significant. Although the results of the straightforward linear probability model did not derive a statistically significant relationship, the majors that amplified the negative relationship between student debt and entrepreneurship were business, communications and professional services. Business definitely makes sense since this is the group of graduates that primarily has to decide whether to start their own companies or work for a finance-related firm. Communications majors, face similar

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decision given that although the major may be skewed towards an industry, due to the well roundedness of the major, entrepreneurship is a viable decision. Professional services majors also make sense in this framework since these are the people that majored in pre-law, pre-dental, and pre-medical who usually get specialized, graduate-level degrees and go on to open their own practices.

Therefore, in order to observe a more clear-cut relationship between student and entrepreneurship, the linear probability model will be run again, only this time it will be conditional on the majors that amplify the negative relationship between student debt and entrepreneurship. This time, in addition to debt at 25 and parent household income, the model will also include whether or not the father and mother attended college deriving the following equation:

$$Y = \alpha + \beta_1 x_1 + \beta_2 x_2 + \beta_3 x_3 + \beta_4 x_4$$

$$\{if \text{ business major}=1 / \text{ communications major}=1 / \text{ professional services}=1\}$$

Table 4 shows that once we run the linear probability model conditional upon the majors described above, the negative relationship becomes more prominent and more importantly it is statistically significant. The linear probability specifically states that for every additional \$11.8 a student incurs of debt, that student is 1% less likely to become an entrepreneur. Additionally, Table 4 shows that the constant is 7.82%, meaning that without debt (debt equaling zero), the student has 7.82% chance of becoming an entrepreneur and additionally it is statistically significant. Additionally, Table 4 shows that there is a positive relationship between parent household income and entrepreneurship, albeit not as a strong or statistically significantly.

### ***E. Linear Probability Model for Wage Workers***

Using industry data for non-entrepreneurs mentioned in the sample summary description, we used the same linear probability model to regress debt at age 25, parent household income, mother's college attendance and father's college attendance on the 13 industries that were identified in the sample. Table 5 shows that the industries that were statistically significant were: manufacturing, wholesale retailing, Professional Services and Public Administration. Table 5 shows that for each additional \$6.28 an individual incurs in student debt, the individual is 1% more likely to take a job in manufacturing; with an additional \$10.70 an individual incurs in student debt, that individual is 1% more likely to take a job in retail trading; with every additional \$10.09 an individual incurs in student debt, that individual is 1% more likely to take a job in professional services; and for every additional \$5.64 an individual incurs in student debt, that individual is 1% more likely to take a job in public administration.

The positive relationship between student debt and taking a job in professional services, which are jobs involving highly specialized training like jobs in law, medicine, or engineering, makes a lot of sense. The first interpretation of this relationship could be by looking at which majors typically tend to go into professional services jobs. Professional service jobs require highly specialized training and therefore the two buckets of majors who are recruited from the professional services industry are STEM majors or students who majored in technical majors like nursing, pre-law, pre-med, pre-dental. Table 3 exemplified that students who majored in STEM were less likely to become entrepreneurs as debt increased. One explanation could be that the majority of STEM majors go on to complete either a Master's Degree or a PhD in order to maximize their full capacity. Additionally, innovation associated with STEM majors requires a deeper breadth of knowledge that simply cannot be achieved at an undergraduate level for the

average STEM major, and therefore graduate training is required. For STEM majors who choose to go into the workforce right after undergraduate university, the primary recruiting opportunities are for highly specialized positions. At a young age, specialization in wage employment is valued higher than general, well roundedness. This is why nurses, paralegals, mechanics, and engineers, have a higher starting salary than the average wageworker, but see less of an increase in their salary over time. However, going back to the fundamental entrepreneurial conditions, a more diverse skillset is favored in entrepreneurship. Additionally, it's important to note that because students who major in STEM or professional services tend to stay in school for longer than the average student, they will be more debt adverse because of their higher-than-average expected future debt accumulation.

The positive relationship between Public Administration jobs can best interpreted by considering the requirements needed to be considered for one these jobs. Most public administration jobs require a graduate or master's degree, which tend to be very expensive, implying that these students tend to borrow more money over time. Additionally, the job prospects for an individual who completes a Master's in Public Administration are very industry-specific, usually in government sector. Because this degree is highly specified, and furthermore, highly linked to an industry, wage income highly exceeds entrepreneurial yield gained. Additionally, it is important to note that an entrepreneur's success is measured by his ability to exploit arbitrage<sup>12</sup> in the market through innovation (Evans and Jovanovic, 1989). Due to the highly regulated, highly bureaucratic nature of the government sector, there is little to no arbitrage to exploit using a Master's of Public Administration.

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<sup>12</sup> Arbitrage is define as "the simultaneous buying and selling of securities, currency, or commodities in different markets or in derivative forms in order to take advantage of differing prices for the same assets" (Investopedia, 2015).

The positive relationship between jobs in the manufacturing industry simply reiterates that students with more student debt are more likely to take higher paying jobs in the short-run versus in order to decrease debt. The average salary for a manufacturing job for individuals with at least a Bachelor's degree in the United States ranges from \$41,000 to \$114,000, increasing with experience. Additionally, if the individual opts to work for a large manufacturing industry, he will also most likely receive benefits packages, which includes health insurance. Using our model for the entrepreneurial decision, it is evident that an indebted student will be constrained since his net personal wealth ( $z$ ) will be negatively affected with the burden debt motivating him to choose to become a waged worker instead of an entrepreneur.

## **VI. Implications and Conclusion**

The main limitations of the study are the (1) low number of observations, and (2) the inability to clearly control for all endogenous variables that contribute to the decision to become an entrepreneur in order to view the direct relationship between entrepreneurship and student debt. However, the study did show that the direct relationship between entrepreneurship and student debt varies across different majors. Furthermore, the model exemplifies that student debt plays a deciding factor in recent graduates' employment decisions, usually opting for higher paying jobs (at least in the short-term) as debt accumulation increases. This study shows that as student debt increases, those students who have the skills necessary to yield higher benefits from becoming self-employed (business, communications, and professional services majors) are less likely to become entrepreneurs. The students who major in business, communications, and professional services show a mix of highly specialized and generalist traits. For example, communications and business major's training, although industry-specific to some extent is also

general, including writing classes, fundamental business and math classes etc. Professional services majors like pre-law, pre-med, or pre-dental, or architecture students are the most specialized out the collection of majors. It is important to reiterate that the majors used for the first linear probability model shown in Table 3, these are the students whose highest degree attained was a Bachelor's degree, meaning they did not go onto receiving their specialized degree. These students therefore have both the benefit of being relatively specialized in a field, which helps them identify potential entrepreneurial opportunities, but not so highly specialized to the point they are restricted to simply being an employee for that industry.

The main implication to derive from this study is that the negative relationship between student debt and entrepreneurship is going against the typical U-Shape pattern of entrepreneurship shown in Figure 3. According to, the U-Shape model of entrepreneurship, since the United States is one of the most developed nations in the world, our entrepreneurship rates should be increasing. Figure 5<sup>13</sup> shows that there has been a decline in the number of new entrepreneurial ventures starting in the United States. This trend is particularly alarming because since the late 1990's, during the technology bubble, the United States shifted from a manufacturing industry to a service industry, which theoretically speaking should be the optimal economy for entrepreneurship to flourish. Although the technology bubble was consistent with the transition into a service-based economy, there seems to have been a plateau and what looks to be a decline in rates of entrepreneurship in the future. Besides the benefits of entrepreneurship on the economy, there are significant positive benefits for successful entrepreneurs. For instance, a study conducted by Gentry and Hubbard (2004) found that although entrepreneurs make up roughly 8% to 9% of the working population, entrepreneurs

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<sup>13</sup> Data for this graph was obtained from the Ewing Marion Kauffman Foundation's database tracking the number of new ventures opened from 1973 until 2013.

hold 38% of household assets and 39% of entire net worth in the United States. If student debt is, in fact, deterring college graduates from becoming entrepreneurs, college graduates who have the potential to become able entrepreneurs are being capped in their personal wealth both by direct debt and lack of realized opportunities. Highly able potential entrepreneurs, although initially receive higher-than average salary, in the long run, their salaries will not rise as much or as quickly. It would be interesting to track the entrepreneurship behavior of potential able entrepreneurs over time to analyze whether or not previous job experience enhance entrepreneurial activity. It would also be interesting to perform a couple more analysis on how entrepreneurial trends change over the course of time, particularly with respect to students who attended college but did not borrow money.

An aspect of the study that remains ambiguous is the effect of specialization versus generalization in college. The study shows that although there is favorability towards students with more of “general background” each major that was more likely to become entrepreneur had an aspect of specialization. It would be interesting to observe how an aggregate of endowed/invested skills affect the relationship between entrepreneurship and student debt. Finally, the last implication from this study is the role of higher education institutions in mitigating this problem. It seems highly unlikely that higher education institutions would be able to replace student debt with grants or other alternative solutions due to financial constraints, however one trend that has been appearing is the implementation of entrepreneurial education in core curriculum requirements. A further area of research would be to explore the effect of entrepreneurial education (via formal entrepreneurship majors, experiential entrepreneurial activities etc.) on actual entrepreneurship.

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## Appendix: Tables and Figures

(Table 1)

Table 1

*Summary Demographics Statistics*

	Debt Categories				
	Less than \$1,000	\$1,000-\$10,000	\$10,000-\$25,000	\$25,000-\$50,000	Greater than \$50,000
<b>Race/Ethnicity</b>					
Black	9.45%	14.73%	20.83%	22.78%	33.33%
	(0.014)	(0.019)	(0.026)	(0.047)	(.333)
Hispanic	10.33%	13%	13%	14%	0%
	(0.014)	(0.018)	(0.022)	(0.039)	(0)
Mixed Race	0.66%	1.13%	1.25%	1.27%	0.00%
	(0.004)	(0.006)	(0.007)	(0.013)	(0)
Non-Black /Non-Hispanic	79.56%	70.82%	65.00%	62.03%	66.67%
	(.019)	(0.024)	(0.031)	(0.055)	(0.333)
<b>Type of Institution</b>					
Public	80.33%	78.61%	62.96%	78.26%	0.00%
	(.012)	(0.020)	(0.054)	(0.088)	(0)
Private (Non-Profit)	40.25%	40.87%	59.26%	56.52%	50.00%
	(0.014)	(0.024)	(0.055)	(0.106)	(0.5)
Private (For-Profit)	0.05%	0.07%	12.35%	21.74%	50.00%
	(0.006)	(.013)	(0.034)	(0.088)	(0.5)
<b>Parent HHI</b>					
<\$1250	55.21%	47.84%	50.62%	43.48%	0.00%
	(0.0060)	(.013)	(.021)	(.041)	(.163)
\$1251-\$49400	35.38%	47.36%	40.74%	52.17%	50.00%
	(0.013)	(0.019)	(0.037)	(.133)	(0)
\$49401-\$12750	9.41%	4.81%	8.64%	4.35%	50.00%
	(0.003)	(0.008)	(0.014)	(0.0311)	(0.133)
\$12751-\$20660	0.88%	0.79%	0.85%	0.00%	0.00%
	(0.001)	(0.002)	(.004)	(0)	(0)

(Table 2)

Table 2  
*Sample Summary College Majors by Debt Categories: College  
 Graduates*

	Debt Categories				
	<\$1,000	\$1,000- \$10,000	\$10,000- \$25,000	\$25,000- \$50,000	>\$50,000
Agriculture	0.11% (.0004)	0.85% (.0035)	0% (0)	1.61% (.016)	0% (.0)
Business	19.50% (0.011)	16.11% (0.018)	12.34% (0.037)	17.39% (0.081)	0% (0)
Communication	5.88% (0.007)	4.57% (0.010)	8.64% (0.031)	0% (0)	0% (0)
Education	6.39% (0.007)	7.45% (0.013)	7.40% (0.029)	8.70% (0.060)	0% (0)
Fine Art	3.03% (0.005)	5.77% (0.011)	4.94% (0.024)	13.04% (0.072)	50% (.5)
Health	4.62% (0.006)	5.29% (0.012)	7.41% (0.029)	0.00% (0)	0.00% (0)
Humanities	7.06% (0.007)	7.21% (0.013)	7.41% (0.029)	4.35% (0.0430)	0% (0)
Professional	1.70% (0.04)	0 (0)	1.20% (0.012)	0% (0)	0% (0)
Social Sciences	18.07% (0.011)	21.39% (0.020)	24.69% (0.048)	13.04% (0.072)	0% (0)
STEM	13.87% (0.010)	16.11% (0.018)	13.58% (0.038)	21.74% (0.088)	50% (.5)

**Table 3**

<i>Linear Probability Model</i>	
Variables	Self-Employed (Yes=1, No=0)
Debt At Age 25 ( <i>In Thousands</i> )	-0.00037 (0.00237)
Parent Household Income ( <i>In Thousands</i> )	0.000595** (0.000202)
Business	0.0223* (0.0133)
Communications	0.0618*** (0.0202)
Professional Services	0.0264 (0.0395)
STEM	-0.0521** (0.0143)
Social Sciences	0.0111 (0.0132)
Fine Arts	0.0238 (0.0233)
Humanities	0.0031 (0.0182)
Education	-0.0622** (0.0187)
Health	-0.0794** (0.0318)
Constant	0.0975* (0.0153)
Observations	1,712
R-squared	0.01
Standard errors in parentheses	
*** p<0.01, ** p<0.05, * p<0.1	

**Table 4**

*Linear Probability Model*  
*Conditional on Majors*

	Self-Employed (Yes=1, No=0)
Debt Borrowed by 25 ( <i>in thousands</i> )	-0.0118* (0.00620)
Parent Household Income ( <i>in thousands</i> )	0.000754 (0.0006)
Father Attended College	-0.0107 (0.0282)
Mother Attended College	0.00374 (0.0275)
Constant	0.0782*** (0.0234)
Observations	407
R-squared	0.013
Standard errors in parentheses	
*** p<0.01, ** p<0.05, * p<0.1	

**Table 5**

*Linear Probability Model*  
*(Wageworker Outcomes: Positive Relationship)*

	(1)	(2)	(3)	(4)
VARIABLES	Manufacturing	Retail	Professional Services	Public Administration
Debt Borrowed by 25	0.00628* (0.00361)	0.0107*** (0.00334)	0.0109** (0.00422)	0.00564** (0.00285)
Parent Household Income	-0.000161 (0.0005)	0.000876** (0.0004)	0.000448 (0.0005)	0.000144 (0.0004)
Father Attended College	-0.0014 (0.021)	0.0057 (0.019)	-0.00269 (0.025)	-0.0330** (0.012)
Mother Attended College	0.0222 (0.0203)	-0.0151 (0.0187)	0.0621*** (0.0237)	0.0275* (0.016)
Constant	0.198*** (0.0174)	0.801*** (0.0161)	0.588*** (0.0204)	0.108*** (0.0138)
Observations	1,959	1,959	1,959	1,959
R-squared	0.003	0.009	0.008	0.006
Standard errors in parentheses				
*** p<0.01, ** p<0.05, * p<0.1				

**Table 6**

*Linear Probability Model*  
*(Wageworker Outcomes Negative*  
*Relationship)*

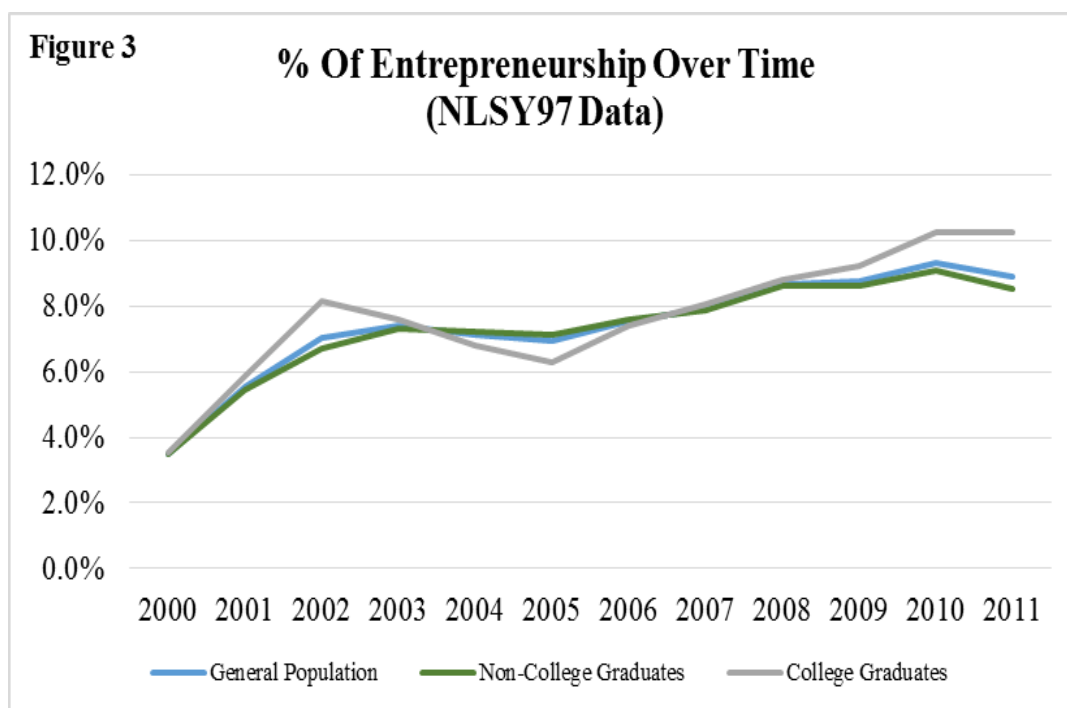
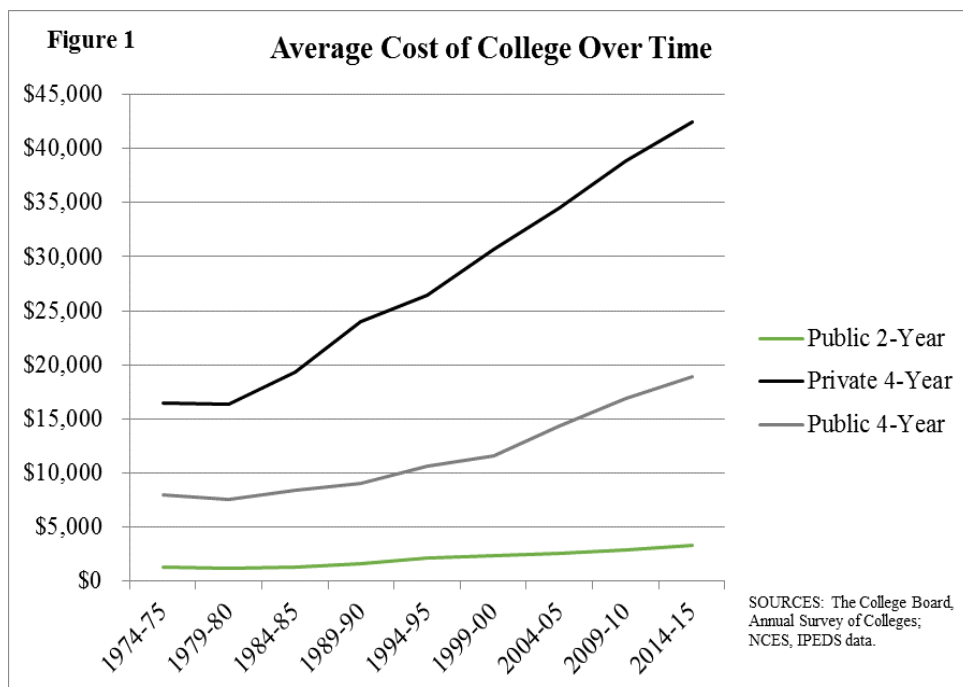
VARIABLES	(1) Military	(2) Education
Debt Borrowed by 25 ( <i>in thousands</i> )	-0.000352 (0.000874)	-0.000137 (0.000521)
Parent Household Income ( <i>in thousands</i> )	-0.00014 (0.000113)	-3.99E-05 (0.0000672)
Father Attended College	0.00509 (0.00491)	0.000895 (0.00293)
Mother Attended College	-0.00414 (0.00508)	-0.00319 (0.00303)
Constant	0.0119*** (0.00422)	0.00513** (0.00252)
Observations	1,712	1,712
R-squared	0.002	0.001
Standard errors in parentheses		
*** p<0.01, ** p<0.05, * p<0.1		



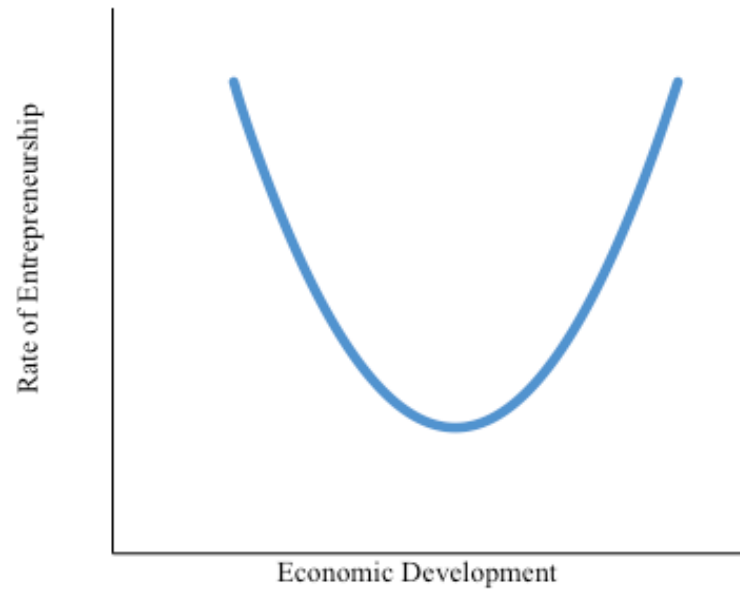
Table 7

Linear Probability Model: Type of Institutions

VARIABLES	Self-Employed at Age 25
Debt at Age 25	-0.0118** (0.00593)
Public Institution (Graduated)	-0.0533 (0.0357)
Private Non-Profit	0.00424 (0.029)
Private For-Profit (Graduated)	-0.0354 (0.0454)
Constant	0.135*** (0.0385)
Observations	465
R-squared	0.015
Standard errors in parentheses	
*** p<0.01, ** p<0.05, * p<0.1	



**Figure 2**      **U-Shape Nature of Entrepreneurship**



**Figure 4**      **% Self-Employed by Student Debt  
(College Graduates)**

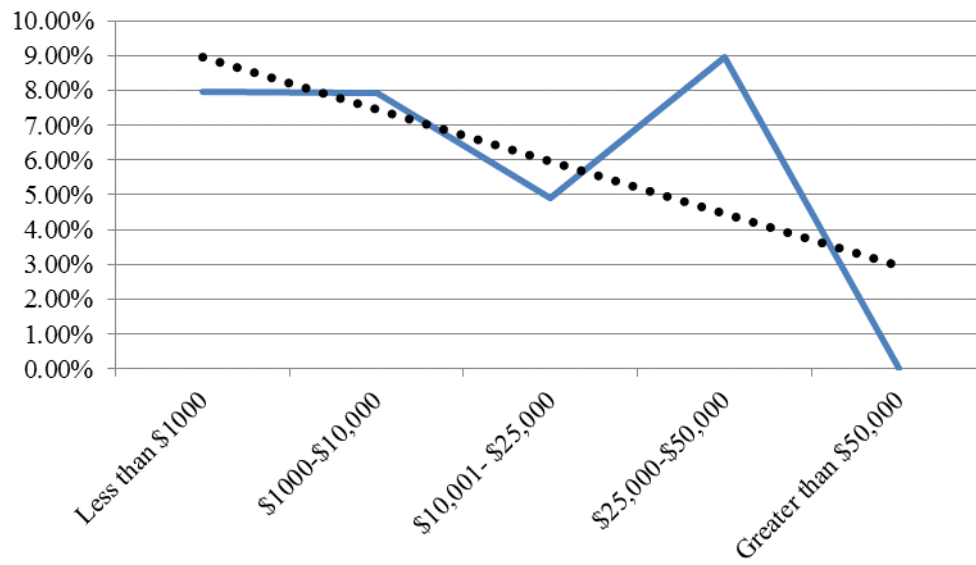
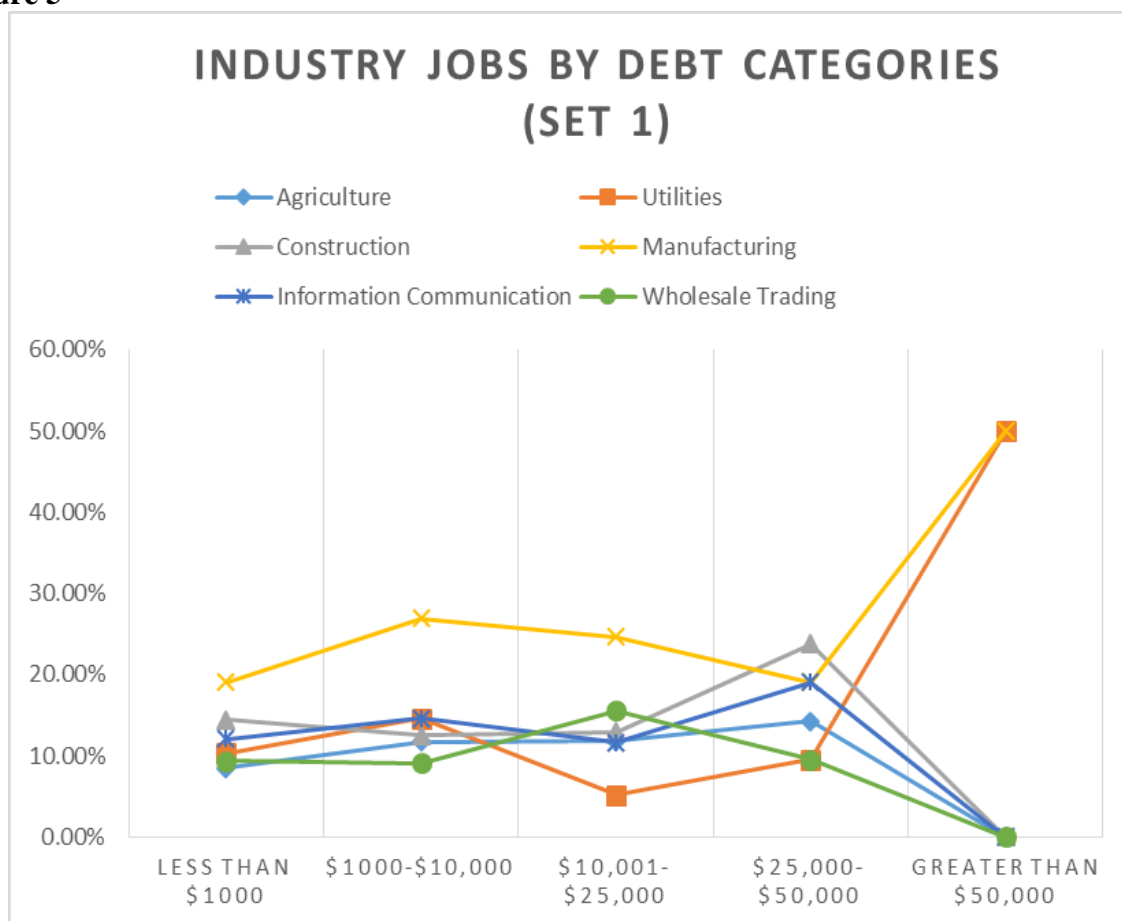


Figure 5



**Figure 6**